Sakai, S.: Biochem. Ztschr., 1914, lxii, 387–445. Zur Pathogenese der Lipämie.

Sass, M.: Ztschr. exp. Path. u. Ther., 1914, xv, 370–378. Die Aenderung der Blutalkalescenz beim Pankreasdiabetes unter dem Einfluss von Muskelkrämpfen.

Schütz, E.: Ztschr. physiol. Chem., 1894, xix, 482–487. Ueber das Vorkommen von Fleischmilchsäure in pathologischen Harnen.

Sellards, A. W.: Johns Hopkins Hosp. Bull., 1914, xxv, 101–112. A clinical method for studying the titratable alkalinity of the blood and its application to acidosis.

Seo, Y.: Arch. exp. Path. u. Pharm., 1909, lxi, 1–6. Ueber das Vorkommen von Lipämie und über die Menge der Lipoidsubstanzen in Blut und Leber beim Pankreasdiabetes.

Stadelmann, E.: Arch. f. exp. Path. u. Pharm., 1883, xvii, 419–444. Ueber die Ursachen der pathologischen Ammoniakausscheidung beim Diabetes mellitus und des Coma diabeticum.

Taylor, A. E.: University of California Publications, Pathology, No. 7, i, 71–86. Studies on an ash-free diet. Digestion and Metabolism, Lea and Febiger, 1912.

Terroine, E. F.: Jour. de physiol. et de path. gén., 1914, xvi, 386–397. Variations lipo-cholestérinémiques au cours de l'inanition et de l'alimentation.

Thiroloix, J., and Jacob, P.: Bull. et mém. de la Soc. méd. des hôp. de Paris, 1910, xxix, 492–494; 1910, xxx, 29–31, 656–658. Compt. rend. Acad. Sci., February 5, 1912, cliv.

Tyson, J.: A Treatise on Bright's Disease and Diabetes, Philadelphia, 1881.

Underhill, F. P.: Jour. Biol. Chem., 1913, xv. Studies on the metabolism of ammonium salts. Jour. Biol. Chem., vols. x, xvii, xx (Hydrazine).

Van Slyke, D. D.: Proc. Soc. Exp. Biol. and Med., 1916, xiii, 134. Gravimetric determination of beta-oxybutyric acid.

Van Slyke, D. D., Stillman, E., and Cullen, G. E.: Proc. Soc. Exp. Biol. and Med., 1915, xii, 165–166. The nature and detection of diabetic acidosis. (Also forthcoming publication in Jour. Biol. Chem.).

von Mering, J.: Ztschr. f. klin. Med., 1888, xiv, 405–423. Ueber Diabetes mellitus. Ibid., 1889, xvi, 431–446. Ueber Diabetes mellitus.

von Noorden, C.: Handbuch der Pathologie des Stoffwechsels, Berlin, 1906, p. 533. Die Zuckerkrankheit, Berlin, 1912, p. 180.

Wakeman, A. J., and Dakin, H. D.: Jour. Biol. Chem., 1909, vi, 373–389. On the decomposition of β-oxybutyric acid and aceto-acetic acid by enzymes of the liver. Ibid., 1910, viii, 105–107. On the decomposition of aceto-acetic acid by enzymes of the liver.

Waldvogel, R., and Hagenberg, J.: Ztschr. f. klin. Med., 1901, xlii, 443–450. Ueber alimentäre Acetonurie.

Walter, F.: Arch. exp. Path. u. Pharm., 1877, vii, 148–178. Untersuchungen über die Wirkung der Säuren auf den thierischen Organismus.

Weintraud, W.: Bibliotheca medica, 1893. Untersuchungen über den Stoffwechsel im Diabetes mellitus und zur diätetischen Therapie der Krankheit.

Woodyatt, R. T.: Jour. Am. Med. Assn., June 17, 1916, lxvi, 1910–1913. Acidosis in Diabetes. Jour. Biol. Chem., vols. xx, xxi, and xxiv. The Harvey Lectures, 1915–1916.

Zawilski: Arb. d. Leipz. Physiol. Inst., 1876, 147. Ref. by Magnus-Levy and Meyer. Dauer u. Umfang d. Fettstromes durch d. Ductus thoracicus.

Zeller, H.: Arch. f. Anat. u. Physiol., Phys. Abt., 1914, 213–236. Einfluss von Fett und Kohlehydrat bei Eiweisshunger auf die Stickstoffausscheidung.

ENDOTHELIOMA OF THE RIGHT BRONCHUS REMOVED BY PERORAL BRONCHOSCOPY.[1]

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THE patient was referred to the author by Dr. J. P. Harley, of Williamsport, Pa., who stated that there were signs of a localized pathology in the right bronchus and right lower lobe which, in his opinion, was not tuberculous and was otherwise so unusual as to demand a diagnostic bronchoscopy. The patient's statement (to Dr. Harley) that he had "a sensation as of a 'ball valve' in the right bronchus shutting off his breath, at times when breathing in, at other times when breathing out, impressed the author with the idea that the patient was a neurasthenic, in view of which a diagnostic bronchoscopy did not seem justifiable. The outcome showed this opinion erroneous. The following is the history:

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[1] Read at the Meeting of the American Laryngological Association, May 10, 1916.

CASE HISTORY.—Mr. F., aged thirty-five years, occupied as a clerk at a desk and around a factory, had had good health until five years ago. Ill health started with a "heavy cold" lasting one year; then he spat blood. Symptoms were less during summer. Every winter's end and spring, symptoms were worse, starting as "heavy cold" and ending in ill health. Patient refers sensations ("restriction, swelling, compression, wheezing") to his right side. Wheezing audible with mouth open, worse after expectoration. Breathing never seems normal. Has sensation of secretion in bronchi, also sensation of "flapping" at times. Also a sensation as of a ball valve suddenly shutting off sometimes inspiration, at other times expiration. Twice yearly has cycle of the following symptoms in the order given: (1) Cold in head. (2) Tightness in chest. (3) Cough. (4) Slight expectoration. (5) Free expectoration. (6) Bleeding, which formerly amounted to about a fourth of a cupful, and was followed in a few days by expectoration of blood clots. Recently only blood streaks were noticed in expectoration.

He spent two years in a sanatarium for the tuberculous. Discharged because no bacilli could be found in sputum, but cough and wheezing persisted. Roentgen-ray examination and sputum examinations, guinea-pig inoculation, Wassermann and therapeutic luetic tests at a large eastern hospital, were all negative. Diagnosis then made: enlarged bronchial gland. No treatment was beneficial. No sputum test had been made during the last twelve months. Bronchoscopy by someone was negative. Septum deflected by "foul tip" at basball some years previously. Septal operation by Dr. Ritter cured persistent headaches.

Diagnoses of various clinicians prior to coming under observation of Dr. Harley were: tuberculosis, chronic right-sided bronchitis; monolateral (right) asthma; compression stenosis of right bronchus, probably caused by adenopathy. Dr. J. Chalmers Da Costa had made what ultimately proved to be a correct diagnosis of obstruction of the right bronchus.

Report of Sputum Examination by Dr. Ernest W. Willetts. "Very careful repeated examinations for tubercle bacilli both by direct smears and also by antiformin method failed to show them. The sputum contains some small whitish masses of solid matter, which, on examination, showed many large cells of varying shapes. Some oval, some spindle-form and others polygonal. They are unlike any of the cells ordinarily seen in sputum and are so like cells from a new growth that a diagnosis of tumor is, I believe, justifiable."

Report of Dr. George C. Johnston. First Fluoroscopy. Fibrosis of right lower lobe bronchus. Patient presented symptoms of unilateral asthma on fluoroscopic examination. Left lung and diaphragm normal; parts were normal in size, shape, and position. Right upper lobe normal, but beginning about one inch below bifurcation a trefoil-shaped shadow extending downward was seen. The diaphragm on the right side could not be distinguished. The lower lobe of the lung was replaced by a shadow having exactly the opacity of the liver. It was impossible to state where the liver ended and the lung began. The appearance was that of an unresolved pneumonia. This portion of the lung could not be made to light up on deep respiration or coughing. No motion of the right portion of the diaphragm could be seen nor could its position be located.

Second Fluoroscopy. At a second examination two days later a considerable change had occurred. Some portions of the dense shadow were clear, showing that the lower lobe was occasionally receiving small quantities of air. The diagnosis of atelectasis due to right bronchial obstruction was made, and diagnostic bronchoscopy was strongly urged.

Roentgenographic examination (Fig. 1) showed an opacity of the lower lobe continuous with the hepatic opacity, the dome of the diaphragm on the right side being indistinguishable.

Physical Examination by Dr. John W. Boyce. At the date of the first examination there was some contraction of the right side and a slight impairment of percussion note, both of them corresponding to extreme expiration as though the air could not get in. Vesicular sound was suppressed and replaced by large wheezing rales. There was evidently obstruction in the right main bronchus, affecting inspiration more than expiration at this particular time. There was some impairment of supracardiac resonance and also an increased area of conduction of whispered voice at the back; but both of these signs (suggestive of bronchial adenopathy) extended rather to the left than to the right.

Aneurysm or other mediastinal tumor having been excluded, we have to consider the possibility of a single lymphatic gland making pressure on the bronchus. This diagnosis has been suggested by an expert clinician. Against it is the fact that there is no evidence of bronchial adenopathy. Nor can we conceive how pressure from without could exert a valvular effect, occasionally reversing the direction of the valvular action. The same considerations apply to organic stricture almost hermetically tight, large caliber strictures being latent as regards dyspnea. The long duration of attacks seemed to exclude spasmodic stricture.

It remained then for us to consider transparent foreign body and pedunculated intrabronchial growth. Dr. Jackson theoretically excluded the former on the ground that a movable foreign body in the open bronchus would certainly produce purulent sputum and foul breath in less than five years' time. This narrowed down the diagnosis to a movable intrabronchial tumor. The only objection to this diagnosis is, as Dr. George C. Johnston expressed it, that it "explained every item of the history and physical examination too nicely." Clinical diagnoses and pathological conditions rarely fit so precisely.

Bronchoscopy. Under local anesthesia I passed a 9 mm. bronchoscope. A moderate amount of secretion was encountered coming upward from the right bronchus. When this was cleared away and the bronchoscope was inserted into the right bronchus to the point where the image shown at B, in Fig. 2, should normally appear the tumor (A) came into view. The tumor filled a dilatation of the right stem bronchus and sprang from the right bronchial wall, just above the orifice of the middle-lobe bronchus.

The history of five years' duration, the smooth shining surface, slightly nodular shape, and the fact of the tumor having made for itself a dilatation of the bronchus, lead the author, in consultation with Dr. Ellen J. Patterson, to conclude that the growth was benign, probably fibromatous, and to advise immediate removal without withdrawal of the bronchoscope. The patient gave his consent by a slight nod, and the growth was extirpated in a few minutes by successive nips of the bronchoscopic tissue forceps. The bleeding was not severe; possibly as much as two ounces of blood were expectorated. The temperature rose to 102.2° F., the pulse to 98, the respirations to 30. All came to normal in about one week. Expectoration of blood-stained pus gradually diminished until it disappeared at the end of about four weeks. The patient has had uninterrupted good health until the present time—nine months. The present condition of the patient is thus reported by Dr. Harley:

"In replying to you regarding Mr. F's. condition, I wish to say the word "fine" does not half express his good condition. He has gained twenty-six pounds in weight; has enjoyed the best health this winter for six years, not having the slightest bronchial affection all winter; just feeling at the "top of the heap" ever since his operation. I feel sure he is grateful to you every day of his life for this most remarkable cure."

Report of Histological Examination of Tumor by Dr. Ernest W. Willetts:

"Frozen sections show a very cellular structure which presents the general appearances of an endothelial growth, although in some areas there are appearances that indicate epithelial origin. Nuclear changes are not marked, but the growth is so cellular and infiltrates

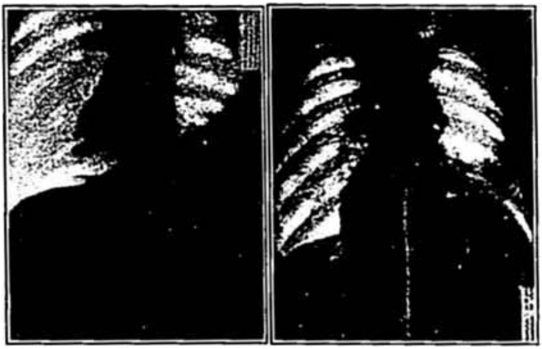

Fig. 1.—Roentgenogram showing (on left) opacity of lower lobe of right lung, due to obstruction of right bronchus by tumor shown in Fig. 2. The right-hand side of illustration shows roentgenogram taken after peroral bronchoscopic removal of tumor.

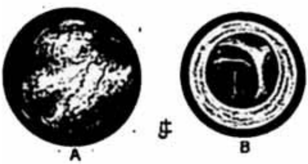

Fig. 2.—Endobronchial obstructing endothelial tumor in a man, aged thirty-five years, who complained of coughing, wheezing, and "a sensation as of a ball valve shutting off his breath, sometimes on inspiration and at other times on expiration. *B*, bronchoscopic view down right main bronchus. *A*, tumor presenting itself in its self-made bronchial enlargement, when the bronchoscopic tube-mouth reached the location at which the view *B*, should appear. Tumor removed with forceps through a bronchoscope passed through the mouth. Patient free from symptoms at end of three weeks and remained perfectly well a year and a half later.

the supporting tissues in such a way as to suggest malignancy. Later examination of paraffin sections only confirms original opinion."

REMARKS. In discussing the paper of Dr. J. M. Ingersol at the meeting of the American Laryngological Association in 1914, I spoke against the attempt at bronchoscopic removal of endotracheal malignancy; and such being my conviction, I would not have removed the endobronchial growth in the present case had I not felt at the time that it was benign. The present condition of the patient, however, indicates that Dr. Ingersol's position as to the possibilities of bronchoscopic removal may be nearer right than my own, though he referred only to tracheal growths, while my case was bronchial. It would not be right, however, on the basis of this unique case, to sanction the indiscriminate bronchoscopic attack of pulmonary malignancy. It seems scarcely possible, bronchoscopically, to remove malignancy completely in many instances; and we all know only too well the results of partial removal elsewhere. So far as the present case is to be taken for guidance, it can apply only to a sharply circumscribed non-ulcerated tumor of very slow growth. Moreover, it may be that the tumor was one of those that is histologically malignant and clinically benign. Or, it may be that it was of a very low degree of malignancy, for we know that there are degrees of malignancy or of individual vulnerability; and, as stated by Wright, it is not possible to make a prognosis from the histological examination of a growth. Finally, we know that recurrence is yet possible. In view, however, of the very great rarity of the case and the necessity for us all to be alert to the possibilities of diagnostic bronchoscopy, longer delay in making this report seemed inadvisable, especially in view of the fact that the present condition of the patient and his months of perfect health fully justified the relatively minor operation under local anesthesia, even if the growth ultimately recurs.[2]

CONCLUSIONS. 1. Diagnostic bronchoscopy is indicated in cases of monolateral "asthma," bronchitis, bronchial obstruction, and in cases of tuberculosis where persistent search fails to show tubercle bacilli.

2. Peroral bronchoscopic removal of an endobronchial tumor is feasible under local anesthesia.

3. General anesthesia might have permitted clotting of blood in the lower bronchi before bechic expulsion, involving septic risk.

4. Peroral bronchoscopic removal may be justifiable in a malignant endobronchial growth if small, circumscribed, and not ulcerated.

5. As this is the only recorded case of apparent cure of an endothelial endobronchial tumor by peroral bronchoscopy, and only the second endoscopic removal of any form of malignant growth from a bronchus, it would be unwise to make too many or too sweeping deductions.

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[2] One and one-half years have now elapsed and the patient is in perfect health, without expectoration or any other symptom.